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National Renewable Energy Laboratory

Innovation for Our Energy Future

Western Wind and Solar Integration Study Stakeholder Meeting Overview

Debbie Lew
NREL

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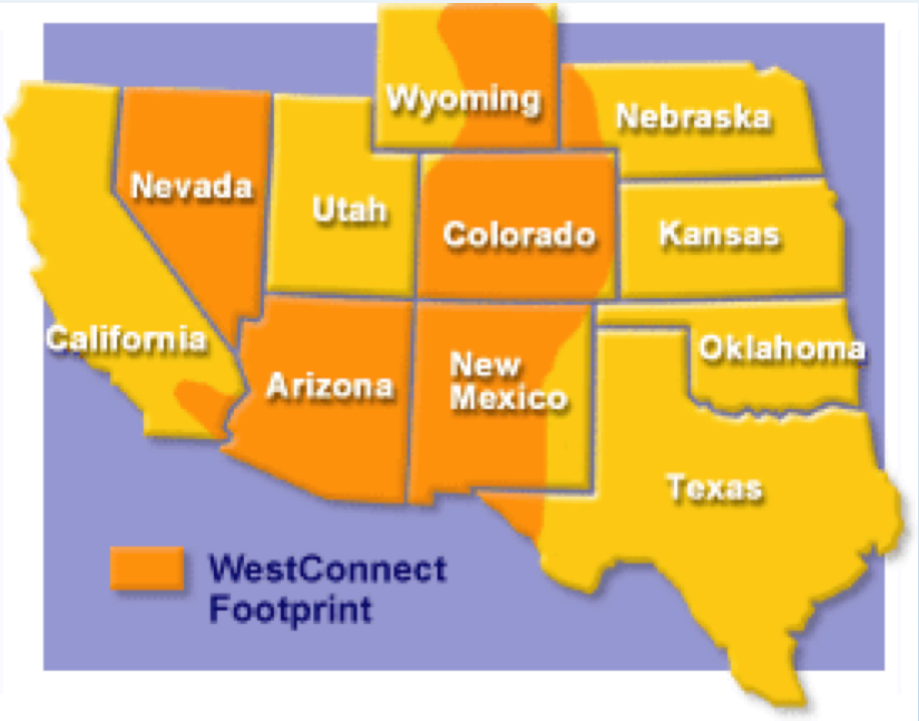
earch Institute • Battelle

Overview

- Goal
  - To understand the costs and operating impacts due to the variability and uncertainty of wind, PV and concentrating solar power (CSP) on the WestConnect grid
  - Not the cost of wind or solar generation
- Scope of study
  - Operations, not transmission study
  - Study year – 2017 to line up with WECC studies
  - Simulate load and climate of 2004, 2005, 2006 forecast to 2017



Issues to Investigate

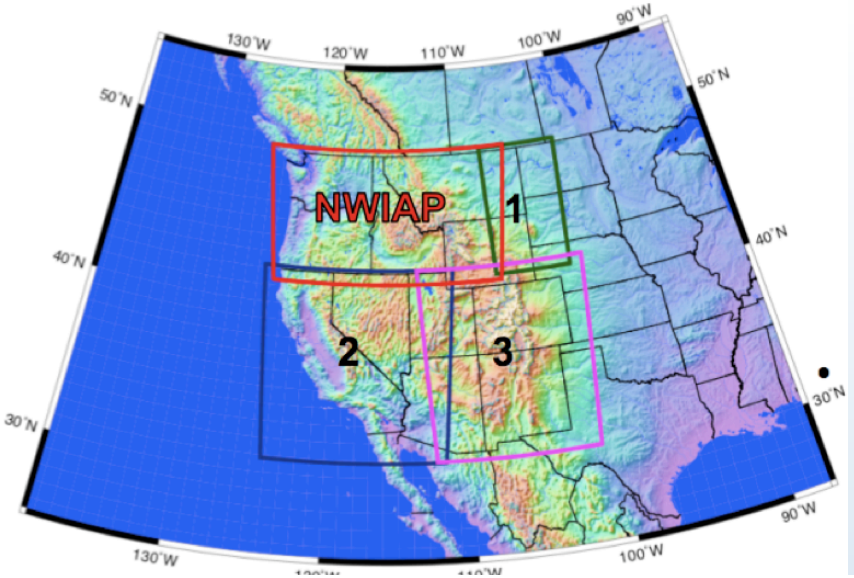
- How do local resources compare to better resources via long distance transmission?
- Can balancing area cooperation (virtual control area) help?
- Role of storage
- Increased reserve requirements
- Geographic diversity – how much is there and does it help?
- How can hydro help?

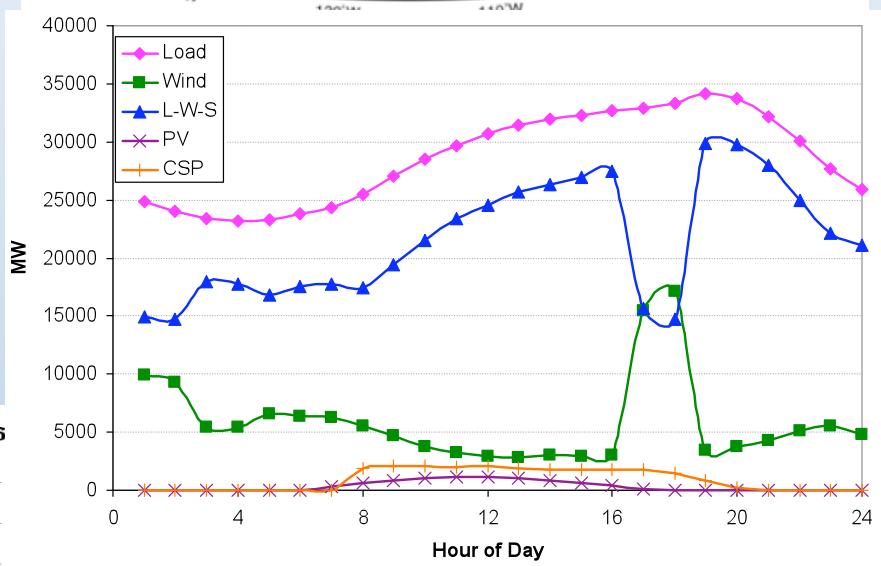
Major Tasks

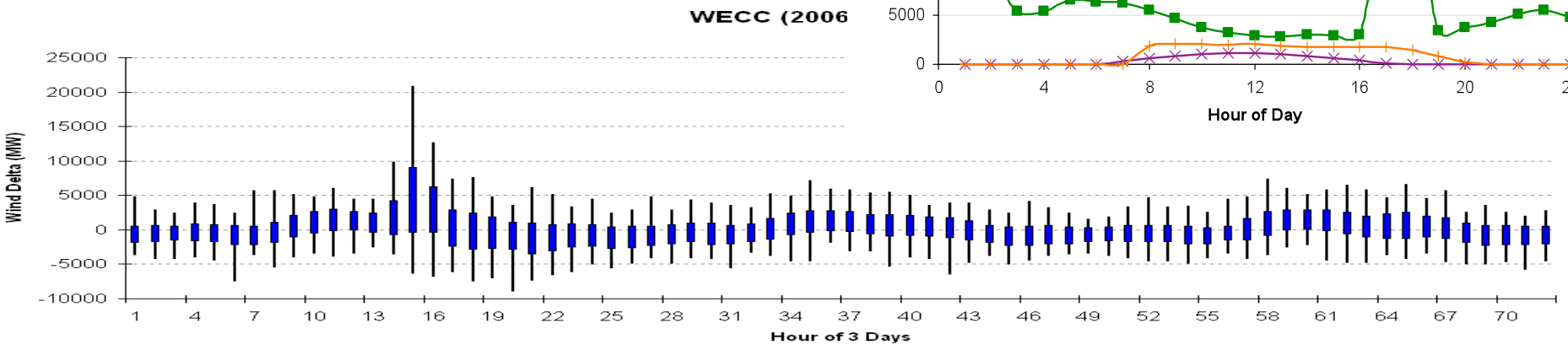
- Utility, solar, and wind data collection/development
- Preliminary analysis; propose scenarios
- Stakeholder Meeting - Aug 2008
- Revise wind dataset; start running scenarios
- Stakeholder Webcast - Mar 2009
- Complete 3 scenarios; propose additional scenarios/ analyses
- Stakeholder Meeting - July 2009
- Remaining scenarios/analyses
- Draft and final reports; Stakeholder Meeting – end 2009 / beg. 2010

Wind dataset

- "Seams" issues, in time and space, occurred in initial runs
  - Large wind ramps that were not real required re-running of model
  - Increased variability every 3rd day, where model runs are stitched together, resulted in dropping every 3rd day from statistical analysis
- Validated against meteorological towers and wind plant output
  - Dataset gives conservative results
- Forecast bias

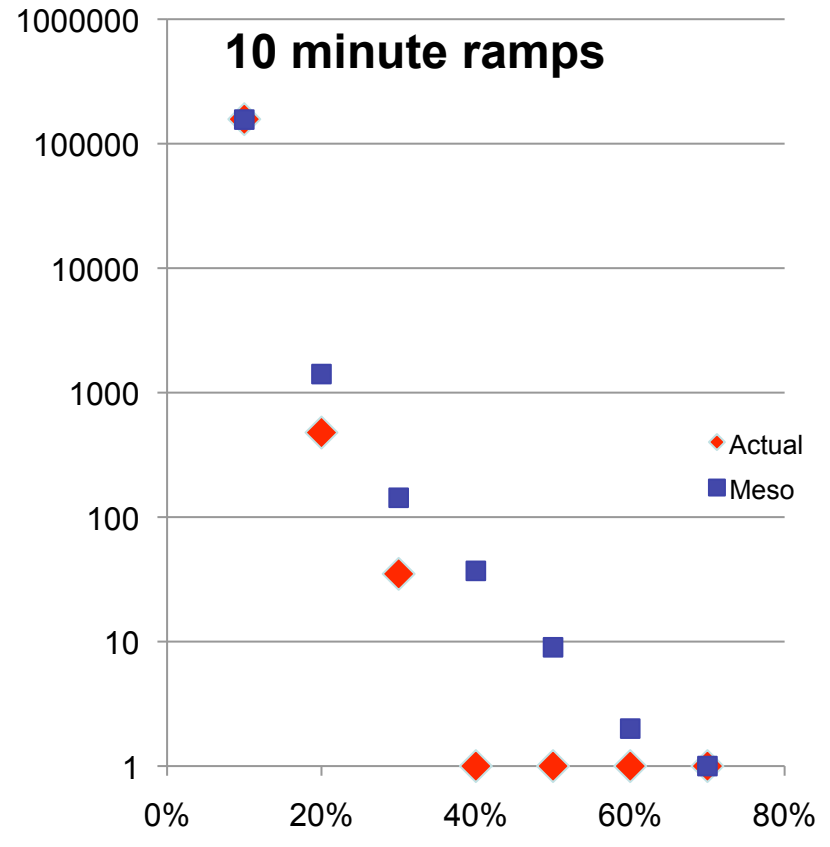


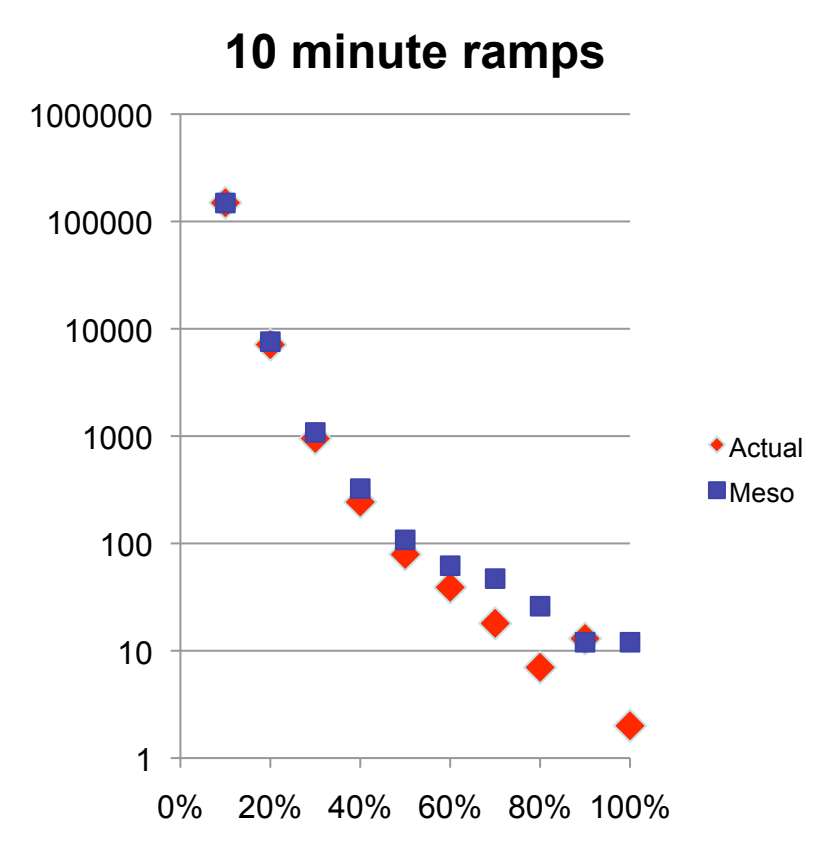




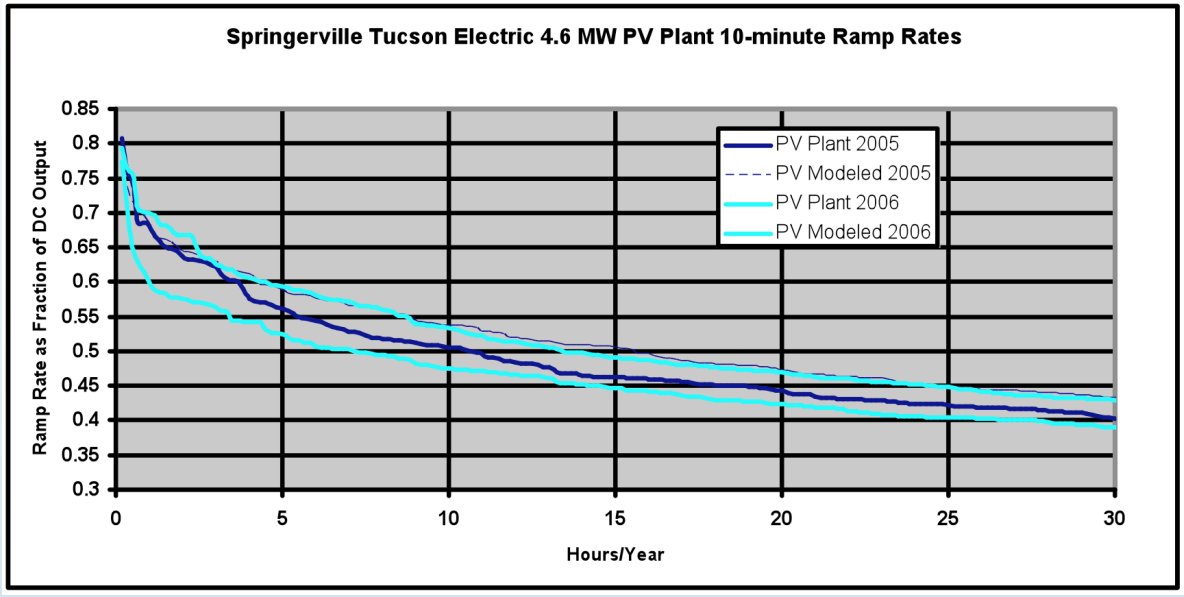
The most important part of validation is the ramp validation

- Texas validation of 536 MW in 5 plants
- Another state



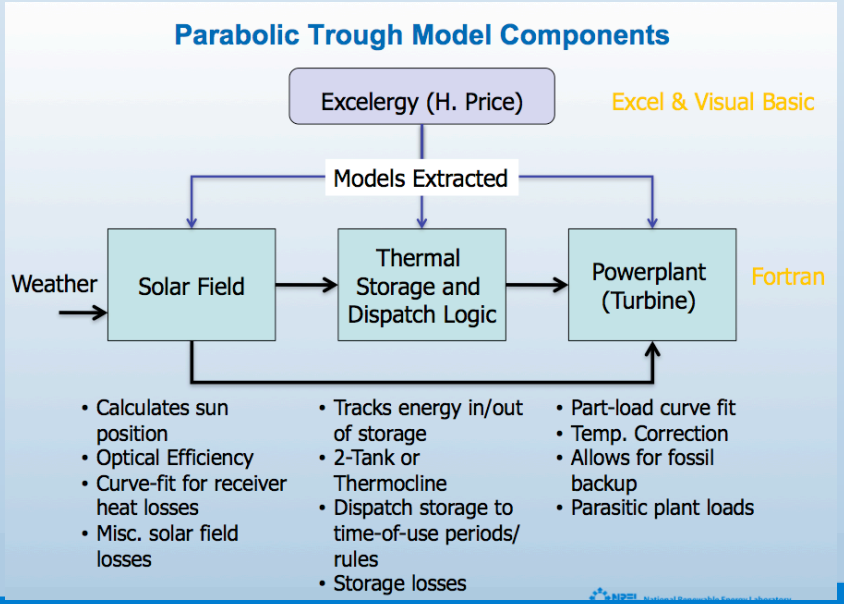


Solar datasets



Satellite cloud cover model produced 10 km hourly solar radiation data. Noise was introduced to develop 10 min data reproducing variability of measured PV plants.

CSP was modeled with 6 hours thermal storage which eliminated the need to model 10 min CSP output. Initially the thermal storage dispatch was based on SCE's load shape.



Information

- WWSIS
  - Official website at
  - http://westconnect.com/planning_nrel.php
  - Additional information at
  - http://wind.nrel.gov/public/WWIS
  - Western wind dataset at:
  - http://www.nrel.gov/wind/westernwind/
  - Solar (and wind) dataset at:
  - http://mercator.nrel.gov/wwsi/
- Questions?
  - Debra.Lew@nrel.gov
  - 303-384-7037